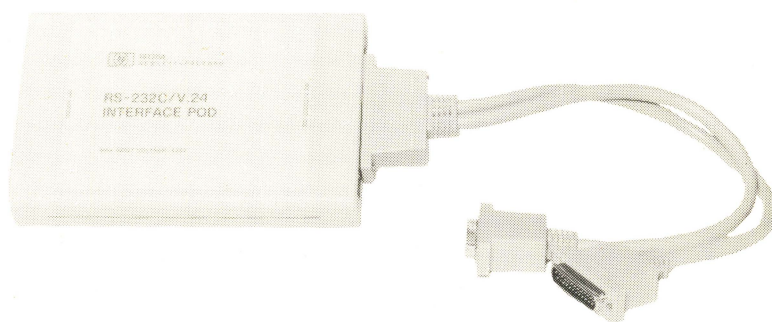


O P E R A T I N G A N D S E R V I C E M A N U A L

**MODEL 18135A (RS232C/V.24)
AND
MODEL 18139A (MIL-188C)
INTERFACE PODS**



SAFETY

This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section I for general safety considerations applicable to this product.

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment, except that in the case of certain components listed in Section I of this manual, the warranty shall be for the specified period. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.



OPERATING AND SERVICE MANUAL

18135A RS-232C/V.24 INTERFACE POD AND 18139A MIL-188C INTERFACE POD

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed **2316A** (HP 18135A RS-232C-V.24) and **2316A** (HP 18139A MIL-188C).

For additional important information about serial numbers see **INSTRUMENTS COVERED BY MANUAL** in Section I.

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MANUAL PART NO: 18135-90001
Microfiche Part No: 18135-90002

PRINTED JULY 1983

WARNING**SAFETY**

If this instrument is to be energized via an autotransformer for voltage reduction, make sure the common terminal is connected to the earthed pole of the power source.

BEFORE SWITCHING ON THIS INSTRUMENT, the protective earth terminals of this instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding).

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Whenever it is likely that the protection offered by fuses has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

GROUNDING

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal can make this instrument dangerous. Intentional interruption is prohibited.

HIGH VOLTAGE

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Adjustments and service described herein are performed with power supplied to the instrument while protective covers are removed. Energy available at many points, if contacted, result in personal injury.

CAUTION**LINE VOLTAGE**

BEFORE SWITCHING ON THIS INSTRUMENT, make sure instrument requirements match the voltage of the power source.

GROUNDING

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that all devices connected to this instrument are connected to the protective (earth) ground.

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that the line power (mains) plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.)

IEC SYMBOLS

The following is a list of key IEC symbols used by Hewlett-Packard. All symbols are normally applied adjacent to the device requiring the symbol. They shall not be placed on removable parts likely to be detached or lost.



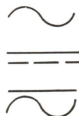
Instruction Manual symbol: If necessary, to preserve the apparatus from damage it is necessary for the user to refer to the instruction manual, then shall the apparatus be marked with this symbol (IEC 348;16a).



Terminal devices fed from the interior by live voltages that may be dangerous when connecting to or disconnecting from those devices shall be marked with the flash shown when the voltage exceeds 1 KV: The flash shall be red (IEC 348;18c).



Earth Terminals. If the use of this symbol for the protective earth terminal is not permitted by National Standards, it may be modified, for example, by being placed inside a circle (IEC 348;18a).



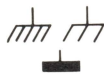
AC current (IEC 117-1, symbol No. 3).



DC current (IEC 117-1, symbol No. 2).



AC or DC current (IEC 117-1, symbol No. 8).



Frame or chassis connection. The hatching may be completely or partly omitted if there is no ambiguity. If the hatching is omitted, the line representing the frame or chassis shall be thicker (IEC 117-1, symbol No. 87).

A	Ampere (IEC 117-4, symbol No. 356).
V	Volt (IEC 117-4, symbol No. 357).
VA	Voltampere (IEC 117-4, symbol No. 358).
W	Watt (IEC 117-4, symbol No. 360).
Wh	Watt-hour (IEC 117-4, symbol No. 361).
VAh	Voltampere-hour (IEC 117-4, symbol No. 362).

Hz

Hertz (IEC 117-4, symbol No. 365).



Contactor, normally closed. In order to avoid confusion with the symbol for a capacitor, the distance between the horizontal (as drawn here) lines should be at least equal to the length of those lines (IEC 117-3, symbol No. 215.2).

In addition the following describes the use of Warnings, Cautions and Notes used in HP Automatic Test System Manuals.

Warnings, cautions and notes. (All) Warnings and cautions shall precede the text to which each applies but notes may precede or follow applicable text depending on the material to be highlighted. Warnings, cautions, and notes shall not contain procedural steps nor shall they be numbered. When a warning, caution, or note consists of two or more paragraphs, the heading WARNING, CAUTION, NOTE, shall not be repeated above each paragraph. If it is ever necessary to precede a paragraph by both a warning and a note, or a caution and a note, etc, they shall appear in the sequence as noted, namely, warnings, cautions, notes. Such inserts in the text shall be short and concise and be used to emphasize important and critical instructions.

WARNING

An operating procedure, practice, etc, which, if not correctly followed, could result in personal injury or loss of life.

CAUTION

An operating procedure, practice, etc, which, if not strictly observed, could result in damage to, or destruction of, equipment.

NOTE: An operating procedure, condition, etc, which it is essential to highlight.

Health hazards precaution data. (All) When hazardous chemicals or adverse health factors, in the environment or use of the equipment cannot be eliminated, appropriate precautionary requirements shall be included.

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**Figure 1-1. RS-232C/V.24 Interface Pod
(Model 18139A MIL-188C Interface Pod Not shown)**

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

This Operating and Service Manual contains information required to install, operate, and service the Hewlett-Packard Models 18135A RS-232C/V.24 and 18139A MIL-188C Interface Pods. The 18135A Interface Pod is shown in Figure 1-1.

This manual is divided into eight major sections which provide the following information:

SECTION I, GENERAL INFORMATION, provides specifications, safety considerations, accessory identification, and a brief description of the accessories.

SECTION II, INSTALLATION, provides information for initial inspection, preparation for use, power requirements, operating environment, and storage and shipment.

SECTION III, OPERATION, provides cable description, instructions to connect the Interface Pod to the 4955A and the network under test, and a brief description of RS-232C/V.24 and MIL-188C standards.

SECTION IV, PERFORMANCE TESTS, are performed after the HP 4955A is connected to the Interface Pod, the Performance Tests are located in the HP 4955A Protocol Analyzer Service Manual (HP 04955-90004).

SECTION V, ADJUSTMENTS, there are no adjustments for HP 18135A RS-232C/V.24 or HP 18139A MIL-188C Interface Pods.

SECTION VI, REPLACEABLE PARTS, provides information required to order all replaceable parts and assemblies.

SECTION VII, MANUAL BACKDATING CHANGES, contains information to backdate the manual for earlier accessories and to maintain compatibility with the HP 4955A Protocol Analyzer.

SECTION VIII, SERVICE, provides service and troubleshooting information. This includes theory of operation, block diagrams, component locators, and schematics.

1-2. SPECIFICATIONS

HP 18135A RS-232C/V.24 Interface Pod specifications are listed in Table 1-1. Table 1-2 lists specifications for HP 18139A MIL-188C. These specifications are the performance standards or limits against which the accessory can be tested.

1-3. SAFETY CONSIDERATIONS

Whenever internal circuits are exposed, caution must be exercised. Observe all warnings and cautions marked on the accessory or listed in procedures.

Table 1-1. Model 18135A RS-232C/V.24 Specifications

ELECTRICAL:	
Active Input voltage:	+3 to +25 = Binary 0 -3 to -25 = Binary 1
Max. Input Voltage:	±25 VDC
Input Impedance:	>10 kohms
Active Output Voltage:	-12 to -5 = Binary 1 +5 to +12 = Binary 0
PHYSICAL:	
Dimensions:	20.3 cm x 12.4 cm x 3.6 cm
(Interface Pod)	(8 in x 4.9 in x 1.4 in)
Weight including cable:	794 gr (28 oz)
Interface Pod Y-Cable	
Length:	46 cm (18 in)
OPERATING	
Temperature	0°C to +55°C (32°F to 131°F)
Altitude	Up to 4600 metres (15,000 ft)
STORAGE	
Temperature	-40°C to +75°C (-40°F to 167°F)
Altitude	Up to 15,300 metres (50,000 ft)

Table 1-2. Model 18139A MIL-188C Specifications

ELECTRICAL:	
Active Input voltage:	+0.5 to +6 = Binary 1 -0.5 to -6 = Binary 0
Max. Input Voltage:	±25 VDC
Input Impedance:	>10 kohms
Active Output Voltage:	-6 to -4 = Binary 1 +4 to +6 = Binary 0
PHYSICAL:	
Dimensions:	20.3 cm x 12.4 cm x 3.6 cm
(Interface Pod)	(8 in x 4.9 in x 1.4 in)
Weight including cable:	794 gr (28 oz)
Interface Pod Y-Cable	
Length:	46 cm (18 in.)
OPERATING	
Temperature	0°C to +55°C (32°F to 131°F)
Altitude	Up to 4600 metres (15,000 ft)
STORAGE	
Temperature	-40°C to +75°C (-40°F to 167°F)
Altitude	Up to 15,300 metres (50,000 ft)

1-4. INSTRUMENTS COVERED BY MANUAL

This accessory has a two part serial number. The serial number is in the form 0000A00000. The first four digits and the letter comprise the serial number prefix. The last five digits form the sequential suffix unique to each accessory. The content of this manual applies directly to accessories with the same or lower serial number prefix as listed under SERIAL PREFIXES on the title page.

An accessory manufactured after the printing of this manual may have a serial prefix higher than listed on the Title Page of this manual. This indicates that the Interface Pod has been modified, a yellow Manual Change Sheet will accompany the manual to provide information to adapt the manual to the newer accessory.

1-5. DESCRIPTION

The HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods provide the connection between the HP 4955A Protocol Analyzer and the Data Terminal Equipment (DTE) and/or Data Circuit-Terminating Equipment (DCE). The HP 18135A follows CCITT V.24 and EIA RS-232C electrical, mechanical, functional, and procedural specifications. The HP 18139A meets Military Standard 188-C.

Figure 1-2 illustrates typical placement of the Interface Pod during monitor mode in a network. The 4955A operates in two modes, as a passive monitor of all data and control signals on a digital link or as a simulator, driving data and control signals to exercise the network or specific components.

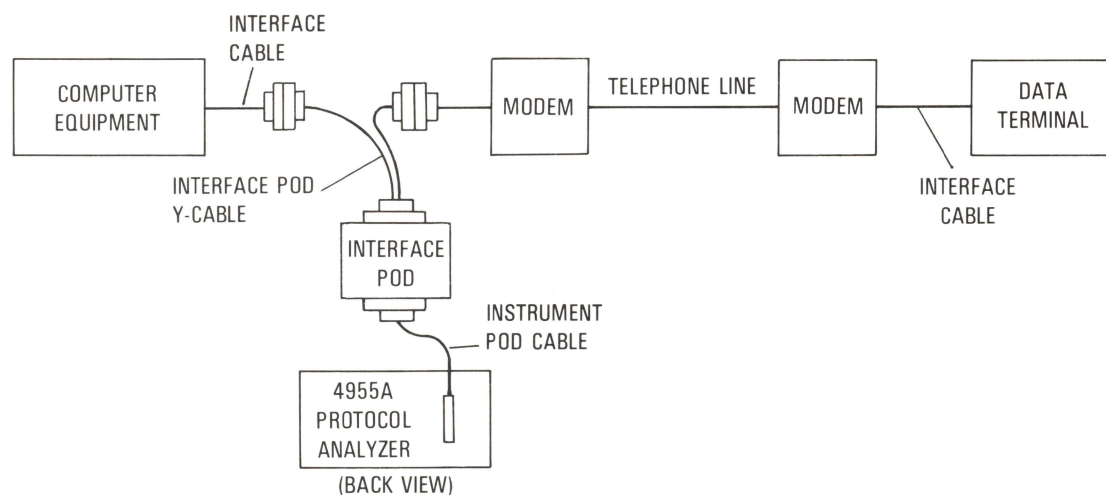


Figure 1-2. Interface Pod in Typical Monitor Mode Setup

1-6. RELATED MANUALS

Operating information for the Protocol Analyzer is located in the 4955A Operating Manual (HP 04955-90015). Service information including Interface Pod Performance Tests is located in the 4955A Service Manual (HP 04955-90004).

1-7. USER REPAIR

Internal repairs to the instrument should be performed by authorized Service Centers only. For assistance, contact the nearest Hewlett-Packard Sales and Service Office, listed at the rear of this manual.

1-8. WARRANTY

Instrument warranty is as listed on the inside of the front cover.



SECTION II

INSTALLATION

2-1. INTRODUCTION

This section contains information for initial inspection, preparation for use, power requirements, storage, and shipment of the HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods.

2-2. INITIAL INSPECTION

Inspect the shipping container for damage. If the container or cushioning material is damaged, keep it. Check the contents of the shipping container for completeness, then check the unit for any physical damage. Refer to the 4955A Service Manual (HP 04955-90004) for Performance Tests.

If the unit is physically damaged or fails the Performance Tests, notify the carrier and the nearest Hewlett-Packard office listed at the rear of this manual. Hewlett-Packard will arrange for repair or replacement of the Interface Pod without waiting for claim settlement.

2-3. PREPARATION FOR USE

2-4. POWER REQUIREMENTS

The Interface Pod requires no external power source. ± 5 V and ± 12 V are supplied by the HP 4955A Protocol Analyzer through Instrument Pod Cable W14.

CAUTION

When attaching cables to the Interface Pod always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

2-5. CABLES

The Interface Pod comes with one input/output interface, the Interface Pod Y-cable. It connects the Interface Pod to the network under test. Tables 8-1 and 8-2 give a complete description of the cables and pinouts.

2-6. OPERATING ENVIRONMENT

The Interface Pod should be protected from temperature extremes which can cause condensation in the accessory. It may be operated and stored in environments within the following limits:

OPERATING

Temperature 0°C to $+55^{\circ}\text{C}$ (32°F to 131°F)
Altitude Up to 4600 metres (15,000 ft)

STORAGE

Temperature -40°C to $+75^{\circ}\text{C}$ (-40°F to 167°F)
Altitude Up to 15,300 metres (50,000 ft)

2-7. STORAGE AND SHIPMENT

2-8. TAGGING FOR SERVICE

If the accessory is returned to Hewlett-Packard for service, complete one of the blue repair tags located at the end of this manual and attach it to the accessory.

2-9. Original Packaging. Containers and packing material identical to those used in factory packaging are available through Hewlett-Packard sales offices. When returning an accessory to Hewlett-Packard for service, complete and attach the blue repair tag. Mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the accessory by model number and serial number.

2-10. Other Packaging. Use these general instructions for packaging with commercially available materials:

1. Wrap the accessory in heavy paper or plastic. If shipping to a Hewlett-Packard Sales or Service Office, include a completed blue repair tag.
2. Use a strong shipping container, such as a double-wall carton with 275 lbs burst test.
3. Use a layer of shock absorbing material, 70-100 mm (3-4 in.) thick. This provides a firm cushion and prevents movement inside the container.
4. Seal the carton securely and mark it FRAGILE to ensure careful handling.

SECTION III OPERATION

3-1. INTRODUCTION

This section describes connection of the HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods to the HP 4955A Protocol Analyzer and the network under test. A brief description of each standard is given. Refer to the 4955A Operating Manual (HP 04955-90015) for specific Protocol Analyzer operating instructions and test routines.

3-2. SELF CHECK

A 4955A self check routine is automatically performed at power up by the Protocol Analyzer. Interface Pod tests can be performed by selecting the desired test from the 4955A menu. Refer to the 4955A Operating Manual for complete instructions.

3-3. CABLES

Each Interface Pod is connected to two input/output cables. The Instrument Pod cable (W1) connects the Interface Pod to the Protocol Analyzer. The 50 pin connector on this cable is compatible with both the 18135A and 18139A. The other cable is the Interface Pod Y-cable (W2) and connects the Interface Pod to the network under test.

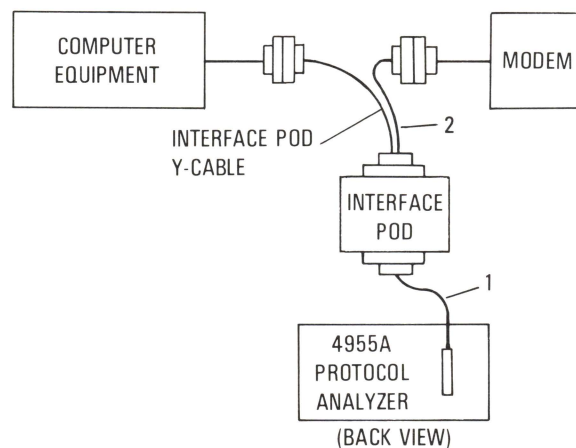


Figure 3-1. Cables

1. W1, the Instrument Pod Cable which is supplied with the 4955A connects the Protocol Analyzer to the Interface Pod.
2. Interface Pod Y-cable W2 connects the Interface Pod to the network under test.

3-4. OPERATOR CHECKS

Operation verification is performed with the Interface Pod connected to the HP 4955A Protocol Analyzer, but not to the network under test. Refer to the 4955A Operating Manual (04955-90015), Section III for combined Protocol Analyzer and Interface Pod Operator Checks.

3-5. OPERATING INSTRUCTIONS

CAUTION

Turn off the 4955A Protocol Analyzer before disconnecting or connecting any Interface Pod.

3-6. SETUP

1. Connect cable W1 from the Protocol Analyzer to the Interface Pod and W2 from the Interface Pod to the network under test. The cable connectors are keyed to prevent backwards connections. Figures 3-2 and 3-3 illustrate typical simulate and monitor mode connections.

CAUTION

When attaching cables to the Interface Pod always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

2. Once cables are connected to the Interface Pod, it effectively becomes a part of the Protocol Analyzer. Operating instructions are given in Section III of the Operating Manual (HP 04955-90015).

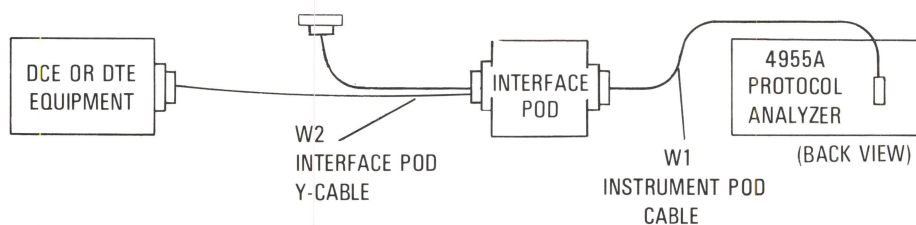


Figure 3-2. Simulate Mode Operation

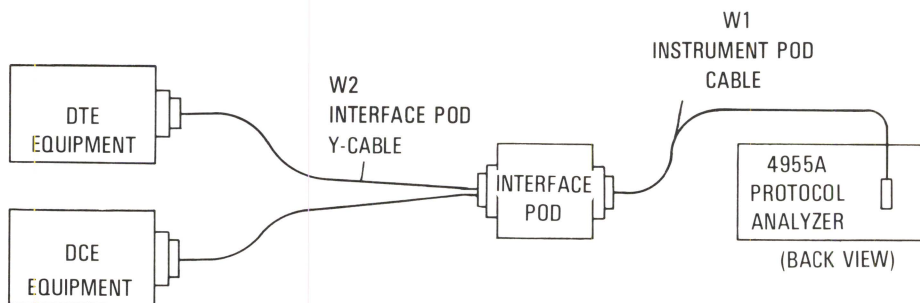


Figure 3-3. Monitor Mode Operation

3-7. PROTOCOL DESCRIPTION

V.24 is a CCITT international standard defining functional interchange circuits. RS-232C is an accepted standard in the United States for data communication interfaces.

3-8. RS-232C

RS-232C is an Electronic Industry Association (EIA) Recommended Standard. The standard describes the mechanical, electrical, functional, and procedural characteristics to establish, maintain, and disconnect the interface between the DTE and DCE.

3-9. V.24

The HP 18135A follows V.24, V.28, and ISO 2110 standards. These standards are collectively referred to in this manual as V.24. ISO 2110 describes the mechanical properties, V.28 the electrical characteristics, and V.24 the functional interchange circuits and procedures governing their interrelationships.

3-10. MIL-188C

MIL-188C follows the EIA RS-232C functional, mechanical, and procedural standards. The electrical thresholds are different and the polarity of signals TXD, RXD, STXD, and SRXD are inverted.



SECTION IV

PERFORMANCE TESTS

4-1. INTRODUCTION

All tests to verify instrument specifications must be performed with the 18135A or 18139A Interface Pod connected to the 4955A Protocol Analyzer. Refer to Section IV of the 4955A Service Manual (HP 04955-90004).



SECTION V ADJUSTMENTS

There are no adjustments for the HP 18135A RS-232C/V.24 or HP 18139A MIL-188C Interface Pods.



SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION

This section contains information for ordering replacement parts. Table 6-1 lists reference designators and abbreviations used, Table 6-2 is a Manufacturers' Code List. Table 6-3 is a Replaceable Parts list. Mechanically the Interface Pod cases and cables are the same. Figure 6-1 is an exploded view of both accessories.

6-2. REPLACEABLE PARTS LIST

Table 6-3 is the list of replaceable parts for the 18135A RS-232C/V.24 with the parts given in alphanumeric order. Table 6-4 lists 18139A Mil-188C replaceable parts. Included is the Reference Designator, HP Part Number, Check Digit, Quantity (total used in accessory), Description, and Manufacturers' Code and Part Number. Chassis and mechanical parts are listed in Figure 6-1.

6-3. ORDERING INFORMATION

To order a listed part, quote the HP Part Number and quantity needed. Address the order to the nearest Hewlett-Packard office. When ordering a part not listed in the manual, include the accessory model number, serial number, and a physical and functional description of the part. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATIONS			
A	= assembly	J	= electrical connector (stationary portion); jack
B	= fan; motor	L	= coil; inductor
BT	= battery	MP	= misc. mechanical part
C	= capacitor	P	= electrical connector (movable portion); plug
CR	= diode; diode thyristor; varactor	Q	= transistor; SCR; triode thyristor
DL	= delay line	R	= resistor
DS	= annunciator; lamp; LED	RT	= thermistor
E	= misc electrical part	S	= switch; jumper
F	= fuse	T	= transformer
FL	= filter	TB	= terminal board
H	= hardware	TP	= test point
		U	= integrated circuit; microcircuit
		V	= electron tube; glow lamp
		VR	= voltage regulator; breakdown diode
		W	= cable
		X	= socket
		Y	= crystal unit (piezo-electric or quartz)

Table 6-1. Reference Designations and Abbreviations (Cont.)

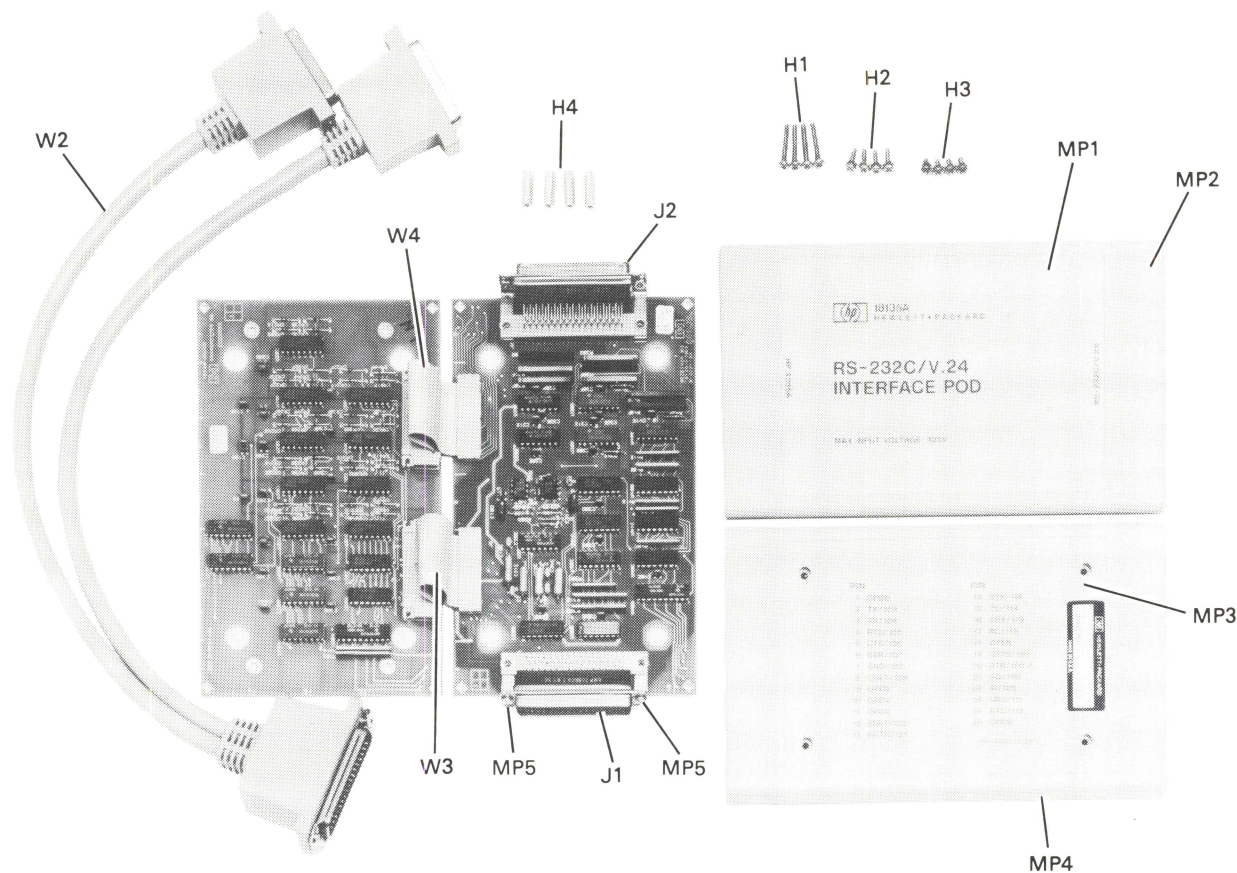
ABBREVIATIONS		
A = amperes	F = female, farads	N.O. = normally open
AC = alternating current	FF = flip-flop	NP = No Polarity
ADD = address	FLM = film	NPN = negative-positive-negative
ADJ = adjust, adjustment	FRNT = front	NPO = negative-positive zero (zero temperature coefficient)
AL = aluminum	FXD = fixed	NRFR = not recommended for field replacement
AR = as required		NS = normally shorting, nanosecond
ASM = algorithmic state machine	G = giga (10^9)	NSR = not separately replaceable
ASSY = assembly	GE = germanium	NYL = nylon
	GL = glass	
B = base	GND = ground(ed)	OBD = order by description
BCD = binary coded decimal	GP = General Purpose	OD = outside diameter
BeCu = beryllium copper	GRA = gray	ORN = orange
BIN = binary	GRN = green	
BLK = black		P = pico (10^{-12})
BLU = blue	H = henries	PC = printed circuit
BP = band pass	HDW = hardware	PCA = printed-circuit assembly
BRN = brown	HEX = hexagon, hexagonal, six	PF = picofarad
BRS = brass	HP = high pass	PIV = Peak Inverse Voltage
BTU = British thermal unit	HR = hour(s)	PK = peak
	HZ = Hertz	PNL = panel
C = collector		PNP = positive-negative-positive
CATH = cathode	IC = integrated circuit	P-P = peak-to-peak
CCW = counterclockwise	ID = inside diameter	PPM = parts per million
CD PL = cadmium plate	IF = intermediate frequency	POLYC = polycarbonate
CER = ceramic	IN. = inch, inches	POLYE = polyethylene
CERMET = ceramic met flm	INCAND = incandescent	POLYSTY = polystyrene
CKTS = circuits	INCL = include(s)	PORC = porcelain
C FLM = carbon film	INSUL = insulation, insulated	POSN = position(s)
CLK = clock	INT = internal	POZI = pozidrive
CLR = clear	INTL = internal	PRV = peak reverse voltage
CMOS = complementary metal oxide semiconductor logic		PWV = peak working voltage
COM = common	K = kilo (10^3), kilohm	P/O = part of
COML = commercial		
COMP = composition	LED = light emitting diode	R = ring
COMPL = complete	LFT = left	RAM = random access memory
COND = conductor	LG = long	ROM = read only memory
CONN = connector	LH = lefthand	RECT = rectifier
CONT = contact	LKWR = lockwasher	RF = radio frequency
CPRSN = compression	LP = low pass	RH = right hand
CTL = complementary-transistor logic	LS = low power Schottky	RMS = root-mean-square
CW = clockwise	LSB = least significant bit	RND = round
		RT = right hand
D = diameter	M = milli (10^{-3}), male, mega (10^6), megohm	RTL = resistor-transistor logic
DC = direct current	MET FLM = metal film	RTNT = retainer
DEPC = deposited carbon	MET OX. = metal oxide	RTRY = rotary
DIA = diameter	MHZ = megahertz	RVT = rivet
DIP = dual in-line package	MFR = manufacturer	RWV = reverse working voltage
DPDT = double-pole, double-throw	MINTR = miniature	
DPST = double-pole, single-throw	MISC = miscellaneous	S = second
DR = drive	MOM = momentary	SB = slow blow
DRVR = driver	MOS = metal oxide semiconductor	SCR = silicon controlled rectifier
DSPL = display	MSB = most significant bit	SE = selenium
DTL = diode-transistor logic	MTCHD = matched	SGL = single
	MTG = mounting	SI = silicon
E = emitter	MTLC = metallic	SHK = shank
ECL = emitter-coupled logic		SIP = single in-line package
ELECT = electrolytic	N = nano (10^{-9})	SKT = socket
ENCAP = encapsulated	N.C. = normally closed, no connection	SLDR = solder
EXT = external	NE = neon	SPCG = spacing
EXTR = extractor	NO. = number	

Table 6-1. Reference Designators and Abbreviations (Cont.)

ABBREVIATIONS		
SPDT = single-pole, double-throw	TOL = tolerance	W = watts
SPST = single-pole, single-throw	TRMR = trimmer	WT = weight
SST = stainless-steel	TRN = turn	WW = wirewound
STL = steel	TTL = transistor-transistor logic	WHT = white
SZ = size	TYP = typical	WIP = wiper
		WIV = working inverse voltage
T = tip	U (μ) = micro (10^{-6})	WSHR = washer
TA = tantalum	UF = microfarad	
TEL = telephone	US = microseconds	X = times, multiple
T.C. = Temp. Compensated, temp. coefficient	V = volt(s)	YEL = yellow
THKNS = thickness	VAR = variable	
TI = titanium	VCO = voltage controlled oscillator	ZNR = zener
TGL = toggle	VDCW = direct current working volts	ϕ = phi, phase
THD = thread	VIO = violet	
THK = thick	VNP = no polarity voltage	

Table 6-2. Manufacturers Code List

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
S0545	NIPPON ELECTRIC CO	TOKYO	JP	
00000	ANY SATISFACTORY SUPPLIER			
01121	ALLEN-BRADLEY CO	MILWAUKEE	WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE	CA	94086
52063	EXAR INTEGRATED SYSTEMS INC	SUNNYVALE	CA	94086
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247



ITEM	HP PART NUMBER	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
MP1	7121-3025	1	TOP COVER LABEL	28480	7121-3025
MP2	5060-7162	1	TOP COVER	28480	5040-7162
MP3	7121-3035	1	BOTTOM COVER LABEL	28480	7121-3035
MP4	5040-4474	1	BOTTOM COVER	28480	5040-4474
MP5	1251-0218	4	CONNECTOR WITH LOCKPOST	28480	1251-0218
W2	8120-3597	1	RS-232C Y-CABLE	28480	8120-3597
W3	5060-7161	1	INTERCONNECT CABLE	28480	5060-7161
W4	5060-7161	1	INTERCONNECT CABLE	28480	5060-7161
J1	1251-8137	1	50 COND D SUBMIN P	28480	1251-8137
J2	1251-7571	1	50 COND D SUBMIN S	28480	1251-7571
H1	2200-0103	4	SCREW, MACH 4-40 .25 IN	00000	ORDER BY DESCRIPTION
H2	2200-0107	4	SCREW, MACH 4-40 .375 IN	00000	ORDER BY DESCRIPTION
H3	2200-0117	4	SCREW, MACH 4-40 .875 IN	00000	ORDER BY DESCRIPTION
H4	0380-1212	4	SPACER 4-40 .625	00000	ORDER BY DESCRIPTION
USED ON MODEL 18139A (MIL-188C) ONLY					
MP1	7121-3886	1	TOP COVER LABEL	28480	7121-3886
MP3	7121-3887	1	BOTTOM COVER LABEL	28480	7121-3887

Figure 6-1. Exploded View 18135A Interface Pod

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	18135-60001	2	1	RECEIVER BOARD (RS-232C)	28480	18135-60001
A1	18139-60001	6		RECEIVER BOARD (MIL-188C)	28480	18139-60001
A1C10C	0160-0374	3	4	CAPACITOR-FXD .10UF +-10% 20VDC TA	56289	150D106X9020B2
A1C10D	0160-3508	9	2	CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3508
A1C11D	0160-0576	5	37	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20C	0160-3879	7	4	CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C20D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C20F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C21B	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C21C	0180-0374	3		CAPACITOR-FXD .10UF +-10% 20VDC TA	56289	150D106X9020B2
A1C21D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C21E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C22B	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C22C	0180-0374	3		CAPACITOR-FXD .10UF +-10% 20VDC TA	56289	150D106X9020B2
A1C22E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C23C	0160-3879	7		CAPACITOR-FXD .01UF +-20% 100VDC CER	28480	0160-3879
A1C24C	0180-0374	3		CAPACITOR-FXD .10UF +-10% 20VDC TA	56289	150D106X9020B2
A1C30B	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C30E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C30F	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C31D	0160-3508	9		CAPACITOR-FXD .1UF +80-20% 50VDC CER	28480	0160-3508
A1C31E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C32D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C32E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C40C	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1C40D	0160-4810	8	7	CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C40E	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C41C	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C41D	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C42C	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C42D	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C43D	0160-4810	8		CAPACITOR-FXD 330PF ±5% 100VDC	02798	CAC02C0G331J100A
A1C41E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A1J1	1251-8137	7	1	CONNECTOR-50-COND D SUBMIN P	28480	1251-8137
A1J2	1251-7571	8	1	CONNECTOR-50-COND D SUBMIN S	28480	1251-7571
A1J3	5060-7161	1	2	CABLE-BOARD INTERCONNECT	28480	5060-7161
A1J4	5060-7161	1		CABLE-BOARD INTERCONNECT	28480	5060-7161
A1R20D	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R20F	1810-0345	6	5	NETWORK-RES 10-SIP33.0K OHM X 5	01121	210B333
A1R20G	1810-0345	6		NETWORK-RES 10-SIP33.0K OHM X 5	01121	210B333
A1R21D	0757-0415	6	2	RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A1R21F	1810-0344	5	3	NETWORK-RES 10-SIP6.8K OHM X 9	01121	210A682
A1R22D	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1R23D	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1R24D	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R25D	0757-0415	6		RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A1R30B	1810-0372	9	2	NETWORK-RES 10-STP22.0K OHM X 9	01121	210A221
A1R30C	1810-0371	8	1	NETWORK-RES 8-SIP100.0K OHM X 7	01121	208A104
A1R30D	1810-0275	1	1	NETWORK-RES 1KX9 (18135A ONLY)	05524	CSC10A01-102G
A1R30E	1810-0406	0		NETWORK-RES 10KX4 (18135A ONLY)	02483	750-83-R10K
A1R30F	1810-0345	6		NETWORK-RES 10-STP22.0K OHM X 5	01121	210B333
A1R30G	1810-0345	6		NETWORK-RES 10-STP22.0K OHM X 5	01121	210B333
A1R31B	1810-0272	8	2	NETWORK-RES 10-SIP330.0 OHM X 9	01121	210A331
A1R31C	1810-0406	0		NETWORK-RES 10KX4 (18135A ONLY)	02483	750-83-R10K
A1R31F	1810-0345	6		NETWORK-RES 10-SIP33.0K OHM X 5	01121	210B333
A1R34E	0683-1065	7	3	RESISTOR 10M 5% .25W CC TC=-900/+1100	01121	C81065
A1R40C	1810-0347	8	5	NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R40D	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R40E	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R40F	1810-0344	5		NETWORK-RES 10-SIP6.8K OHM X 9	01121	210A682
A1R41D	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R41E	1810-0347	8		NETWORK-RES 8-SIP2.2K OHM X 4	01121	208B222
A1R41F	1810-0344	5		NETWORK-RES 10-SIP6.8K OHM X 9	01121	210A682
A1R42E	0683-1065	7		RESISTOR 10M 5% .25W CC TC=-900/+1100	01121	C81065
A1R42F	0683-1065	7		RESISTOR 10M 5% .25W CC TC=-900/+1100	01121	C81065
A1U20B	1820-2749	9	2	IC DRVTR TTL LS DIFF LINE QUAD	01295	AM26LS31CN
A1U20C	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-INP	01295	SN74LS02N
A1U20D	1826-0065	0	2	IC COMPARTOR PRCN 8-DIP-P PKG	50545	UPC311C
A1U20E	1826-0410	9	2	IC OP AMP LOW-BIAS-H-IMPD QUAD 14-DIP-P	01295	TL084CN
A1U20F	1826-0410	9		IC OP AMP LOW-BIAS-H-IMPD QUAD 14-DIP-P	01295	TL084CN
A1U21D	1826-0065	0		IC COMPARTOR PRCN 8-DIP-P PKG	50545	UPC311C
A1U30B	1820-2749	9		IC DRVTR TTL LS DIFF LINE QUAD	01295	AM26LS31CN
A1U30C	1820-1281	2	2	IC DCDR TTL LS 2-T0-4 LINE DUAL 2-INP	01295	SN74LS139N
A1U30D	1820-3283	8	3	IC RCVR TTL LS LINE RCVR QUAD	34335	AM261S34
A1U30E	1826-0719	1	3	IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U30F	1826-0719	1		IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1U31C	1820-3283	0	8	IC RCVR TTL LS LINE RCVR QUAD	34335	AM261S34
A1U40B	1820-2024	3	2	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
A1U40C	1820-1315	3	3	IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	3L585	CD4051DE
A1U40D	1820-1315	3		IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	3L585	CD4051BE
A1U40E	1826-0719	1		IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U41C	1820-1315	3		IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG USED ON MODEL 18139A (MIL 188C) ONLY	3L585	CD4051BE
A1C30C	0160-0576	5	1	CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A1C30D	0160-0576	5	1	CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2	18135-60002	3	1	TRANSMITTER BOARD (RS-232C)	28480	18135-60002
A2	18139-60002	8	1	TRANSMITTER BOARD (MIL-188C)	28480	18139-60002
A2C10D	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C10E	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C10F	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20B	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20D	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20E	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20F	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20G	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C21C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30B	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30D	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30E	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30F	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C31C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2CR20D	1901-0050	3	35	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR24E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR24F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR25E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR25F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR32E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR32F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR40D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR40E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR40F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR41D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR41E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR41F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR42E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR42F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2P3	1251-7335	2	2	SOCKET 26P W/LATCH	28480	1251-7335
A2P4	1251-7335	2		SOCKET 26P W/LATCH	28480	1251-7335
A2R30A	1810-0272	8		NETWORK-RES 10-SIP330.0 OHM X 9	01121	210A331
A2R31A	1810-0372	9		NETWORK-RES 10-SIP220.0 OHM X 9	01121	210A221
A2U10C	1820-1729	3	5	IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U11C	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N

See introduction to this section for ordering information
 *Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2U20A	1820-1729	3	9	IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20B	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20C	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20D	1820-2852	5		MONOCHIP	28480	1820-2852
A2U20E	1820-2852	5		MONOCHIP	28480	1820-2852
A2U20F	1820-2852	5		MONOCHIP	28480	1820-2852
A2U20G	1820-2852	5		MONOCHIP	28480	1820-2852
A2U21C	1820-2852	5			28480	1820-2852
A2U30A	1820-2024	3		IC DRV R TTL LS LINE DRV R OCTL	01295	SN74LS244N
A2U30B	1820-1281	2		IC DCD R TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A2U30C	1820-2203	0		IC RCVR TTL LS LINE RCVR QUAD	34335	AM26LS32PC
A2U30D	1820-2852	5		MONOCHIP	28480	1820-2852
A2U30E	1820-2852	5		MONOCHIP	28480	1820-2852
A2U30F	1820-2852	5		MONOCHIP	28480	1820-2852
A2U31C	1820-2852	5		MONOCHIP	28480	1820-2852
MISCELLANEOUS PARTS						
	0380-1212	4	4	SPACER- 4-40 .625 US PARTS	00000	ORDER BY DESCRIPTION
	2200-0103	2	4	SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0107	6	4	SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	2200-0117	8	4	SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
	0120-3597	0	1	CABLE- Y RS232	28480	0120-3597
	5040-4474	1	1	COVER (BOTTOM)	28480	5040-4474
	5040-7162	0	1	COVER (TOP)	28480	5040-7162
USED ON MODEL 18139A (MIL-188C) ONLY						
A2C11D	0160-0576	5	2	CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C11E	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A2C11F	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A2C12E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2R10D	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1001-F
A2R10E	0757-0424	7		RESISTOR 1.1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1101-F
A2R10F	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-TO-237R-F
A2R11D	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-TO-237R-F
A2U11D	1826-0539	3	1	IC 317 VRGLTR TO-39	27014	LM317H
A2U11E	1826-0559	6	1	IC 337 VRGLTR TO-39	27014	LM337H

See introduction to this section for ordering information
 *Indicates factory selected value



SECTION VII

MANUAL CHANGES

7-1. INTRODUCTION

This section contains information to backdate this manual for accessories with serial prefix numbers lower than listed on the Title Page. It may also contain information about the compatibility of the Interface Pods with the HP 4955A Protocol Analyzer.

7-2. MANUAL CHANGES

To adapt this manual to your accessory, make the changes listed in Table 7-1. Changes are listed by serial prefix. Sequence of changes is as listed. Check the accessory assembly date code and schematic/assembly date code. If different, more than one change may be listed in Table 7-1.

For accessory serial prefixes greater than the number listed on the title page, changes will be listed in the yellow MANUAL CHANGE supplement included with this manual.

Table 7-1. Manual Changes

HP 18135A Serial No.	Make Changes	HP 18139A Serial No.	Make Changes
2224A	1	2237A	1

CHANGE 1

SECTION VI,

Page 6-5, Table 6-3. Replaceable Parts

Add: A1C30C 0160-0576 CAPACITOR-FXD .1 UF $\pm 20\%$ 50VDC CER, CD=5, MFR CODE 28480, MFR P/N 0160-0576

A1C30D 0160-0576 CAPACITOR-FXD .1 UF $\pm 20\%$ 50VDC CER, CD=5, MFR CODE 28480, MFR P/N 0160-0576

Delete: A1R30E 1810-0406 NETWORK-RESISTOR 10K X 4 (18135A ONLY), CD=0, MFR CODE 02483, MFR P/N 750-83-R10K

A1R31C 1810-0406 NETWORK-RESISTOR 10K X 4 (18135A ONLY), CD=0, MFR CODE 02483, MFR P/N 750-83-R10K

A1R30D 1810-0275 NETWORK-RESISTOR 1K X 9 (18135A ONLY), CD=1, MFR CODE 05524, MFR P/N CSC10A01-102G

A1C40D 0160-4810 CAPACITOR-FXD 330PF $\pm 5\%$ 100VDC, MFR CODE 02798, MFR P/N CAC02COG331J100A

A1C43D 0160-4810 CAPACITOR-FXD 330PF $\pm 5\%$ 100VDC, MFR CODE 02798, MFR P/N CAC02C0G331J100A

A1R31C to A1R2, A1R4 and A1R6, PART NUMBER 0757-0442, CD=9, QTY 3, RESISTOR FIXED, 10K OHM $\pm 1\%$; TC=0 ± 100 , MFR CODE 03292, MFR PART NO. C4-1/8-TO-1002-F (REFERENCE FIGURE 7-3, MODEL 18135A ONLY)

Replace A1 receiver portion of schematic with Figure 7-2

Replace Model 18135A, A1 receiver component locator with Figure 7-1

Replace Model 18135A, A1 receiver schematic with Figure 7-3



7-2

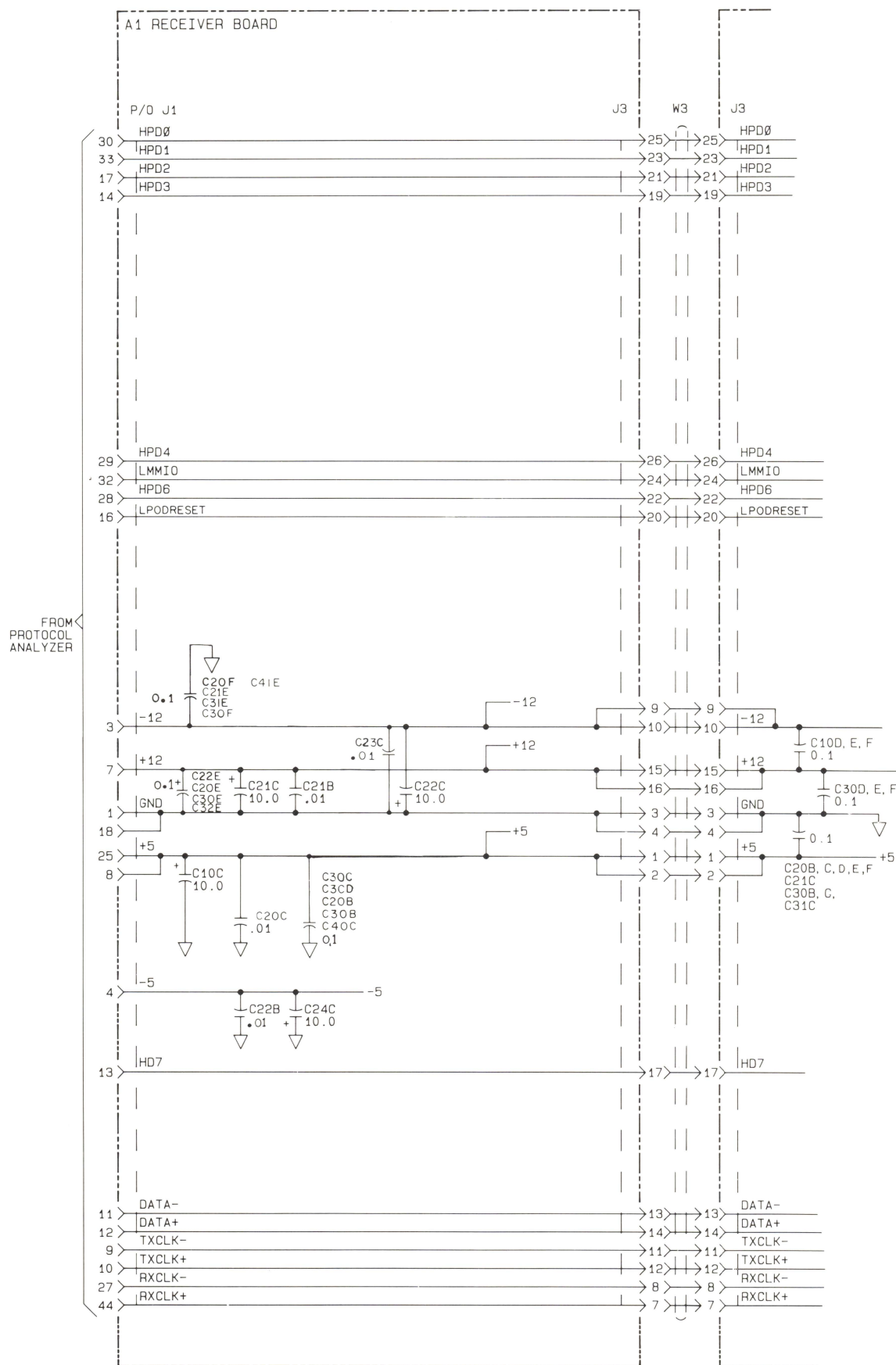


Figure 7-2. Replacement Insert for Figure 8-4.

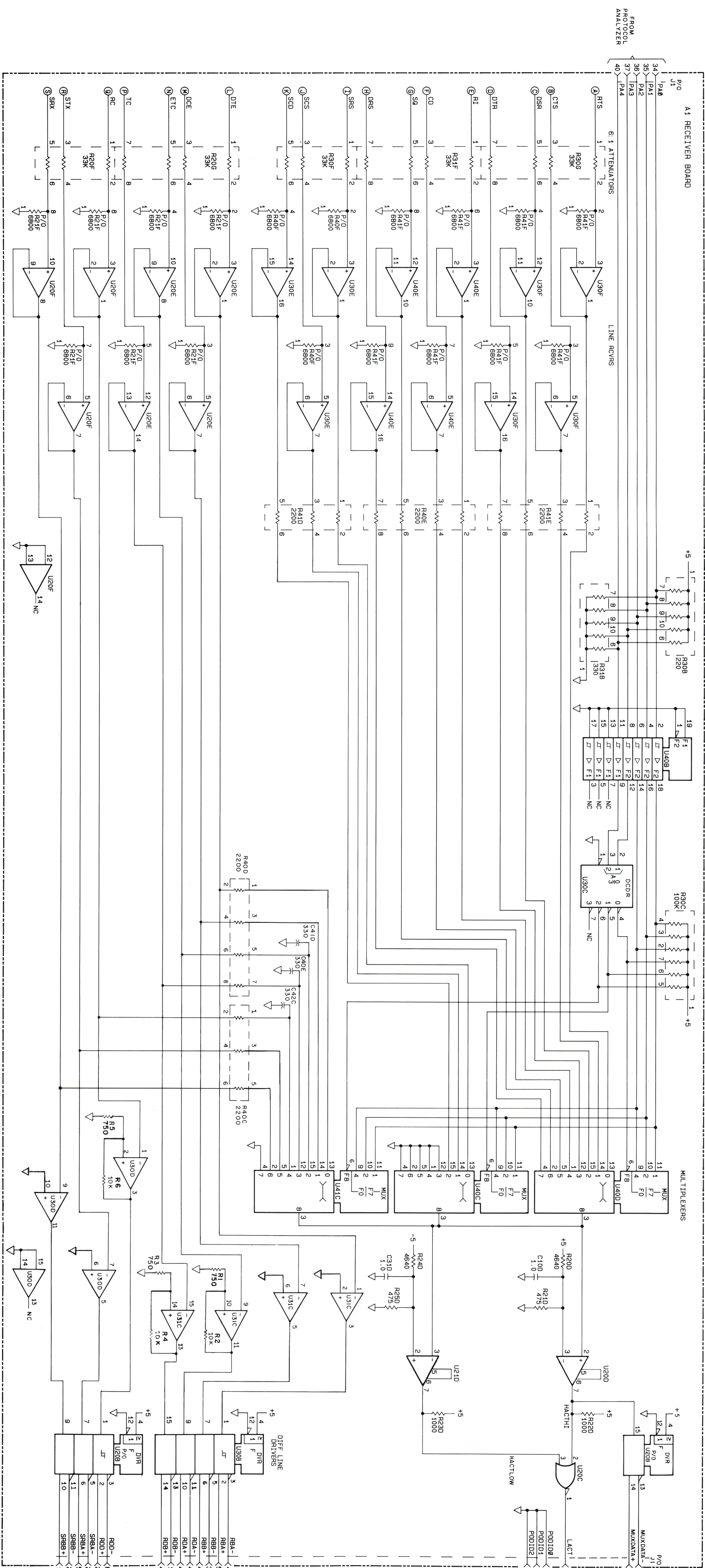


Figure 7-3. Replacement for Model 18135A A1 Receiver Schematic
7-5/(7-6 blank)

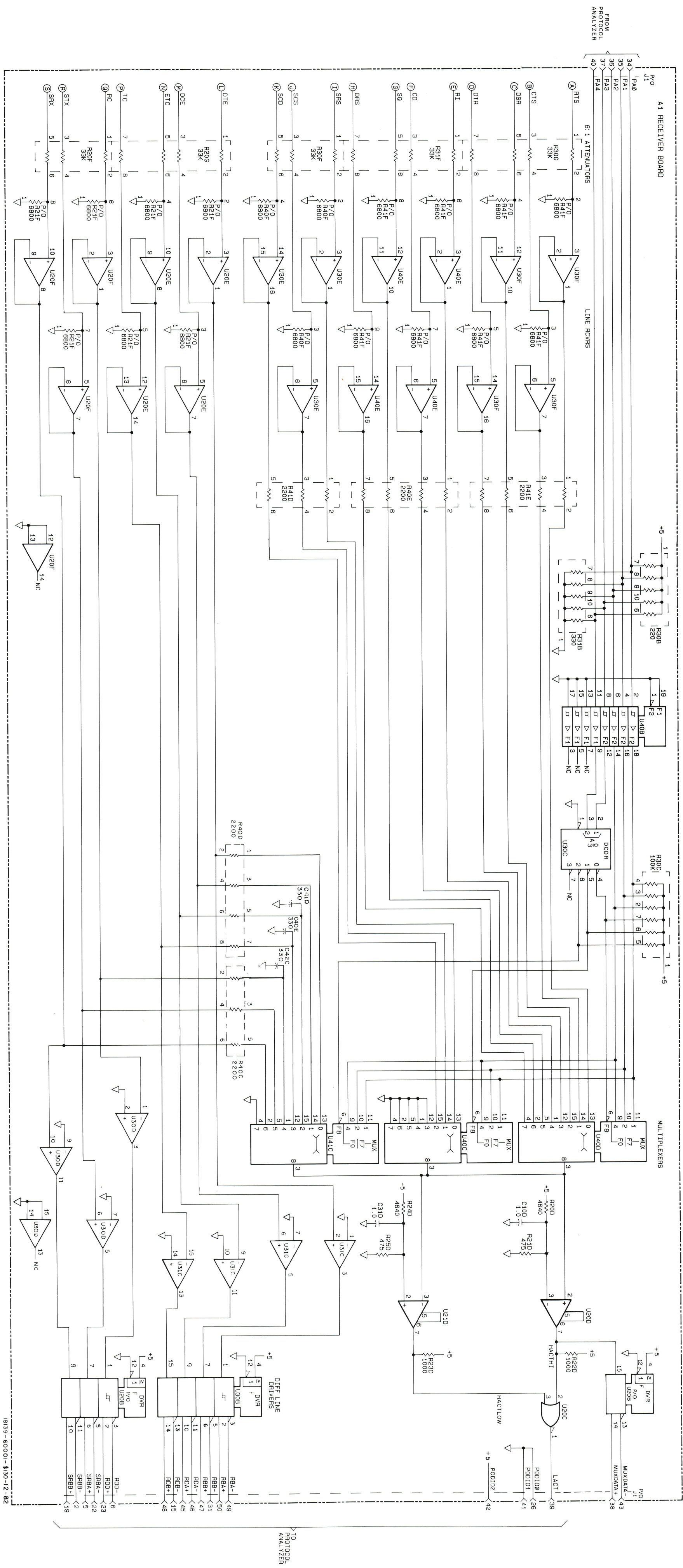


Figure 7-4. Replacement for Model 18139A A1 Receiver Schematic
7-7/(7-8 blank)



SECTION VIII

SERVICE

8-1. INTRODUCTION

This section provides information on the HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods. Information includes theory of operation, block diagrams, component locators, and schematics for each printed circuit assembly. MIL-188C theory of operation is almost the same as RS-232C/V.24, exceptions are given in Paragraph 8-10.

Table 8-1 lists and describes all Interface Pod, RS-232C, and V.24 signal mnemonics. Table 8-2 lists and describes Interface Pod and MIL-188C signal mnemonics.

8-2. DISASSEMBLY/ASSEMBLY PROCEDURES

8-3. DISASSEMBLY

CAUTION

Turn off the 4955A Protocol Analyzer before disconnecting or connecting any Interface Pod.

1. Release the slide locks securing Instrument Pod Cable W1 to the Interface Pod and W2, the Interface Pod Y-cable between the Interface Pod and the network under test.
2. Unscrew and remove the four posidrive screws on the bottom cover of the Interface Pod.
3. Pull the top and bottom case covers apart.
4. Exposed will be the Transmitter and Receiver Boards. They are held together by two ribbon cables, four standoffs and eight screws. Disconnect the ribbon cables only if required by the troubleshooting procedure.
 - a. To separate the Transmitter and Receiver boards, remove them from the Interface Pod case covers.
 - b. Remove the four screws from the Receiver or Transmitter Board.
 - c. The boards will split apart, held together by the W3 and W4 cables.

8-4. ASSEMBLY

1. If necessary reconnect W3 and W4, the ribbon cables between the Transmitter and Receiver Boards.
2. Hold the Transmitter and Receiver Boards with the component sides together. Replace the four standoffs and tighten the eight screws.
3. Orient J1, the connector attaching the Interface Pod to the cable from the Protocol Analyzer with the HP 4955A label on the Interface Pod. Place the boards onto the pegs in the Interface Pod case.

4. Put the two sides of the Interface Pod case together. Insert the four posidrive screws and tighten.
5. Plug W1 from the Protocol Analyzer into the Interface Pod and W2 between the Interface Pod and the network under test.

CAUTION

When attaching cables to the Interface Pod, always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

8-5. THEORY OF OPERATION

The HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods connect the HP 4955A Protocol Analyzer and the DTE or DCE data lines to be analyzed. There are two modes of operation, monitor and simulate.

The theory of operation refers to the block diagram in Figure 8-2. RS-232C/V.24 and MIL-188C are almost the same. Paragraph 8-10 describes the differences.

8-6. A1 RECEIVER BOARD

The Receiver operates in both simulate and monitor mode. In simulate mode, signals originated by the Protocol Analyzer are sent to the network under test. In monitor mode, signals are nonintrusively acquired from the network under test and sent to the Protocol Analyzer for analysis.

The seven clock and data signals from the network under test pass through level shifters U31C, U30D and go to the Protocol Analyzer as well as the comparators.

When a signal is selected for analysis, PA0-PA4 carry the signal address to the Receiver. The address is decoded by U30C and sent to multiplexers U40D, U40C, and U41C. Control signals from the network under test are scanned sequentially at a 3 usec rate. The signal is multiplexed to the Protocol Analyzer through the mark/space and line status comparators via the MUXDATA signal.

8-7. Line Status Comparators. Line status comparator U21D determines if the voltage level of the interface line is active low. A signal is active low if the voltage level is ≤ -3.0 volts.

Comparator U20D determines if the voltage level of the interface is active high. A signal is active high if the voltage level is $> +3.0$ volts. Figure 8-1 is a mark/space diagram for RS-232C.

8-8. Tri-State Detector. U20C combines the outputs of U20D and U21D and determines whether the line is tristate or at a valid voltage level.

There are eighteen addresses which may be selected for scanning. Address bus lines PA0-PA4 carry the address of the line selected to the Receiver.

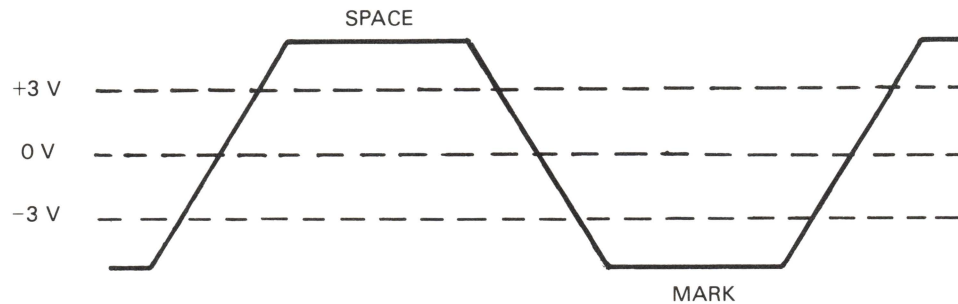


Figure 8-1. RS-232C Interface Line Mark/Space Diagram

8-9. A2 TRANSMITTER BOARD

The Transmitter allows the Protocol Analyzer to drive one or all of the lines of the network under test in simulate mode only. The following explanation refers to the block diagram in Figure 8-2.

4955A operator selected signals are configured by the Data Link Controller Board (DLC) in the Protocol Analyzer. All signals enter the Transmitter Board through cable W3 from the Receiver Board.

Data and clock signals DATA, TXCLK, and RXCLK go directly to the line drivers where they form seven data and clock signals.

Control signals on lines LMMIO, PD0-4, PD6, and PD7 pass through buffer U30A. These signals set up the 18 control signals in addressable latches U20A, U20B, and U20C. PD0-PD2 are the address select lines. LIMMO, PD3, and PD4 are decoded to become latch enables. Data is carried to the driver enable and control line latches by PD6 and PD7. From the latches signals pass to the line drivers. Each line is bit addressable, only one bit can be written to at a time.

8-10. MIL-188C

MIL-188C differs only slightly from RS-232C/V.24. On the Transmitter Board DATA \pm inputs to U30C are inverted. On the Receiver Board the polarity of U31C pins 1 and 2 and 6 and 7 also U30D pins 6 and 7 and 9 and 10 is reversed. These exceptions are highlighted on the schematics.

Table 8-1. RS-232C/V.24 Signal Mnemonics

4955A SOFT LEDS	PIN NUMBER	INTERFACE POD LABEL		EIA CIRCUIT	DESCRIPTION
		MNEMONIC	CCITT		
	1	open		AA	Protective Ground
DTE	2	TX	103	BA	Transmitted Data
DCE	3	RX	104	BB	Received Data
RTS	4	RTS	105	CA	Request To Send
CTS	5	CTS	106	CB	Clear To Send
DSR	6	DSR	107	CC	Data Set Ready
	7	GND	102	AB	Signal Ground
CD	8	CDET	109	CF	Received Line Signal Detector (carrier detect)
	9	open			unassigned
	10	open			unassigned
	11	open			unassigned
SCD	12	SDET	122	SCF	Secondary Received line Signal Detector
SCS	13	SCTS	121	SCB	Secondary Clear to Send
	14	STX	118	SBA	Transmitted Data
TC	15	TC	114	DB	Transmit Signal Element
	16	SRX	119	SBB	Received Data
RC	17	RC	115	DD	Receiver Signal Element Timing (Rcv clk) DCE Source
	18	open			unassigned
SRS	19	SRTS	120	SCA	Secondary Request to Send
DTR	20	DTR	108.2	CD	Data Terminal Ready
SQ	21	SQ	140	CG	110 = Signal Quality Detector 140 = Remote Loopback
RI	22	RI	125	CE	Ring Indicator
DRS	23	DRS	111	CH	Data Signal Rate Selector
ETC	24	ETC	113	DA	Transmit Signal Element Timing (ext transmit clk) DTE source
	25	open			unassigned



Table 8-2. MIL-188C Signal Mnemonics

4955A SOFT LEDS	INTERFACE POD PIN NUMBER	INTERFACE POD MNEMONIC	DESCRIPTION
	1	open	Protective Ground
DTE	2	TX	Transmitted Data
DCE	3	RX	Received Data
RTS	4	RTS	Request To Send
CTS	5	CTS	Clear To Send
DSR	6	DSR	Data Set Ready
	7	GND	Signal Ground
CD	8	CDET	Received Line Signal Detector (carrier detect)
	9	open	unassigned
	10	open	unassigned
	11	open	unassigned
SCD	12	SDET	Secondary Received line Signal Detector
SCS	13	SCTS	Secondary Clear to Send
	14	STX	Transmitted Data
TC	15	TC	Transmit Signal Element
	16	SRX	Received Data
RC	17	RC	Receiver Signal Element Timing (Rcv clk) DCE Source
	18	open	unassigned
SRS	19	SRTS	Secondary Request to Send
DTR	20	DTR	Data Terminal Ready
SQ	21	SQ	Signal Quality Detector
RI	22	RI	Ring Indicator
DRS	23	DRS	Data Signal Rate Selector
ETC	24	ETC	Transmit Signal Element Timing (ext transmit clk) DTE source
	25	open	unassigned

8-11. RS-232C/V.24 INTERFACE POD TROUBLESHOOTING

The Interface Pod test is manually executed from the HP 4955A menu. It checks the functionality of all components in the pod except multiplexer A1U41C. All Interface Pod troubleshooting should be performed while the Interface Pod test is running. Disconnect the Pod from the customers network when running Performance Verification. Pod signals can be traced with a scope and control logic can verified with signature analysis.

Execute the following Interface Pod test and observe the results.

- 1. If DLC-PP fails, check the following signal paths:
RTS, CTS, DSR, DTR, and DTE.
Also check line status comparators A1U20D and A1U21D.
- 2. If CONTROL LEAD fails, check the following signal paths:
RI, CD, SQ, DRS, SRS, SCS, and SCD.
- 3. If DATA/CLOCK fails, check the following signal paths:
DCE, ETC, TC, RC, STX, and SRX.
- 4. If the Interface Pod test passes, but the pod is still suspect, check A1U41C using the following procedure:
 - a. Exit from the HP 4955A Performance Verification menu to obtain the top level menu.
 - b. Select the RUN menu.
 - c. Press EXECUTE. The lead status will be displayed along the top of the display.
 - d. To test A1U41C channels 0-5, connect the following pins, one at a time to +5 V. The corresponding soft LED on the HP 4955A display should change from  to  as the pin is connected. As each pin is checked, disconnect it and connect the next one.

A1U41C Pin Number	Soft LED
13	DTE
14	DCE
15	ETC
12	TC
1	RC

- 5. If no trouble can be found on the Interface Pod, yet the Interface Pod test fails, check the Pod interface circuit on the A6 DLC board.

8-12. SIGNATURE ANALYSIS

LOOP <u> A </u>		PCA <u> A1 INTERFACE POD RECEIVER </u>	
TEST CONDITION <u> 4955A INTERFACE POD TEST RUNNING </u>			
NOTE <u> These signatures check the Interface Pod receiver multiplexer addressing </u>			
JUMPERS <u> None </u>			
SIGNATURES		NORM	
START	<u>+</u>	<u> A1U40B </u>	<u> PIN 11 </u>
STOP	<u>+</u>	<u> A1U40B </u>	<u> PIN 11 </u>
CLOCK	<u>+</u>	<u> A1U40B </u>	<u> PIN 2 </u>
Vh = <u> 0UP7 </u>			
<p>U30C-4 = 0U16 5 = 0UP8 6 = 00UP</p> <p>U40B-2 = 0000 4 = 055H 6 = 0334 8 = 000U 9 = 0U19 11 = 0U19 12 = 000U 14 = 0334 16 = 055H 18 = 0000</p>			

Before checking the signatures, verify the Vh signature (5456) by placing the data probe on +5V. If the Vh signature is 0000 instead of 5456, change the clock from – to + and back to minus while the data probe is on +5 V. Do this several times until Vh = 5456. The signature Multiplexer is now synchronized with the Signature Analysis routine. Check that the clock is on – before continuing.

LOOP <u>B</u>		PCA <u>A2 INTERFACE POD TRANSMITTER BOARD</u>	
TEST CONDITION <u>4955A INTERFACE POD TEST RUNNING</u>			
JUMPERS <u>NONE</u>			
SIGNATURE		QUAL	
START/STOP	<u>+/+</u>	<u>A2U30A</u>	<u>PIN 17</u>
QUALIFIER	<u>-</u>	<u>A2U30A</u>	<u>PIN 13</u>
CLOCK	<u>-</u>	<u>A6U60C</u>	<u>PIN 6</u>
Vh = <u>FP54</u>			
U10C-4 = P6FP 5 = FH9P 6 = 9C3H 7 = 367C 9 = 6FU7 10 = H9PP 11 = C3HF 12 = 67C9 U11C-4 = FU73 5 = 9PP6 6 = 3HFF U20A-4 = 00UP 5 = 003U 6 = 007U 7 = 001U 9 = 0007 10 = 000U 11 = 0003 U20B-4 = P733 5 = FP67 6 = 9FFP 7 = 399F 9 = 7339 10 = P672 11 = FFP5 12 = 99FA		U20C-4 = 3395 5 = 672A 6 = FP54 U30A-2 = C6F6 3 = FP54 4 = P6FC 5 = FP55 6 = 51FF 7 = 0000 8 = 5A74 9 = 00UU 11 = 00UU 12 = 5A74 13 = 0000 14 = 51FF 15 = FP55 16 = P6FC 17 = FP54 18 = C6F6 U30B-1 = 0000 2 = 5A74 3 = 00UU 4 = 5A8C 5 = 9420 6 = 5A74 11 = 3H33 14 = U367	

8-13. LINE RECEIVER A2U30C VERIFICATION

1. Pins 5 and 11 should both have a 153 kHz square wave.
2. Using the Multimeter data probe, check that there is activity on A2U30C pin 3.

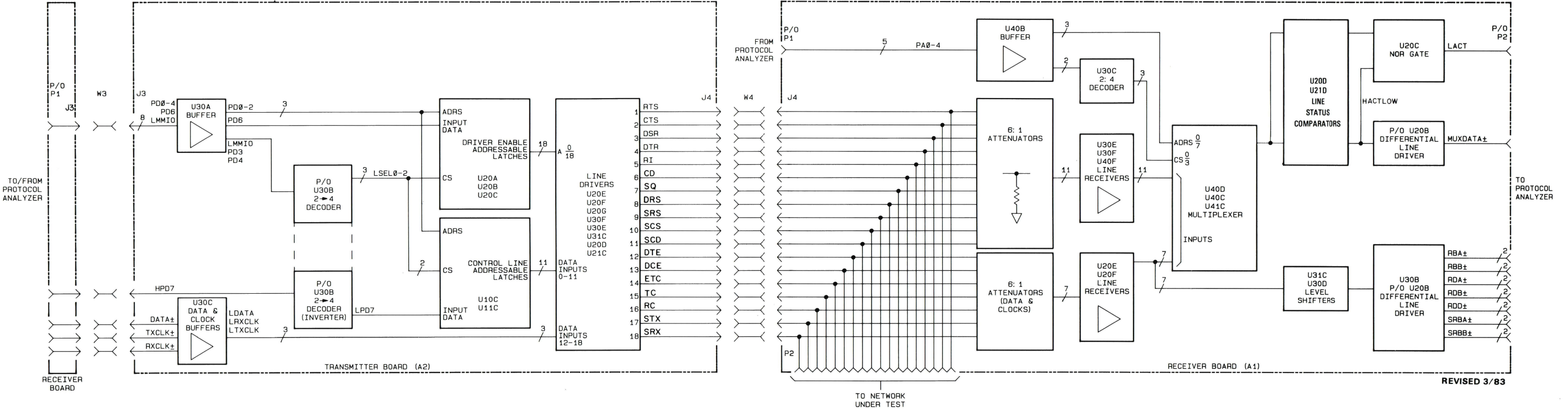
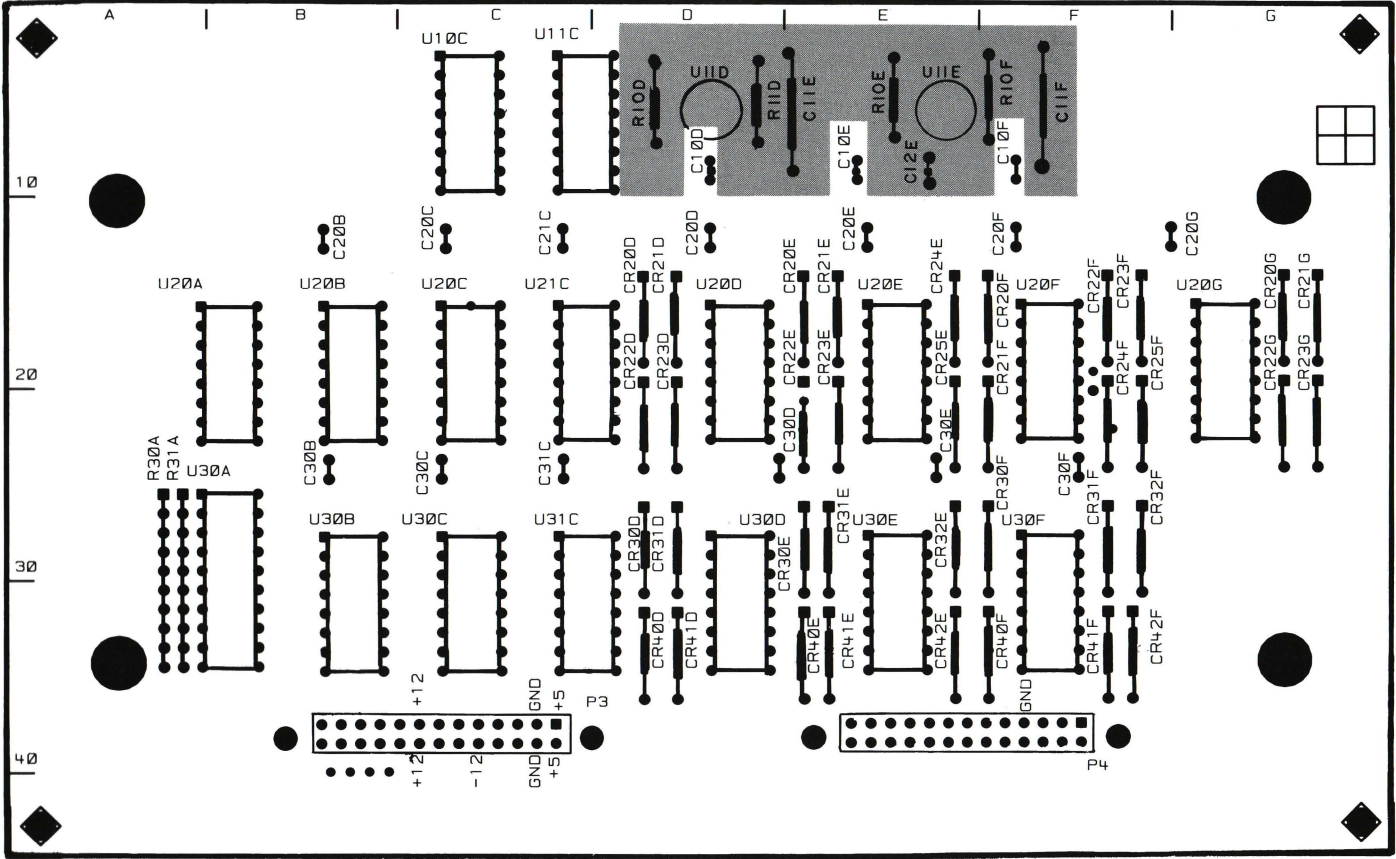


FIGURE 8-4

FIGURES 8-6 AND 8-7

Figure 8-2. 18135A and 18139A Block Diagram



18135-600010-131-10/82

NOTE: Components in gray shaded area appear only on the 18139A

Figure 8-3. A2 Transmitter Component Locator

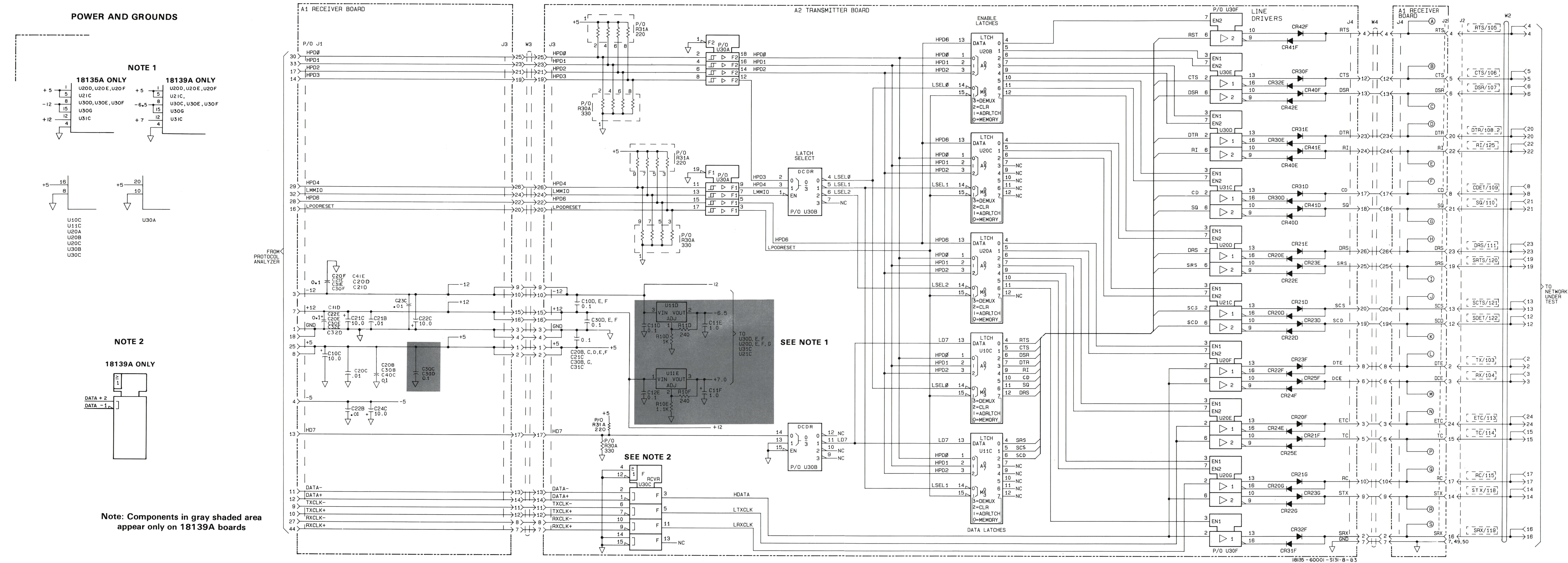
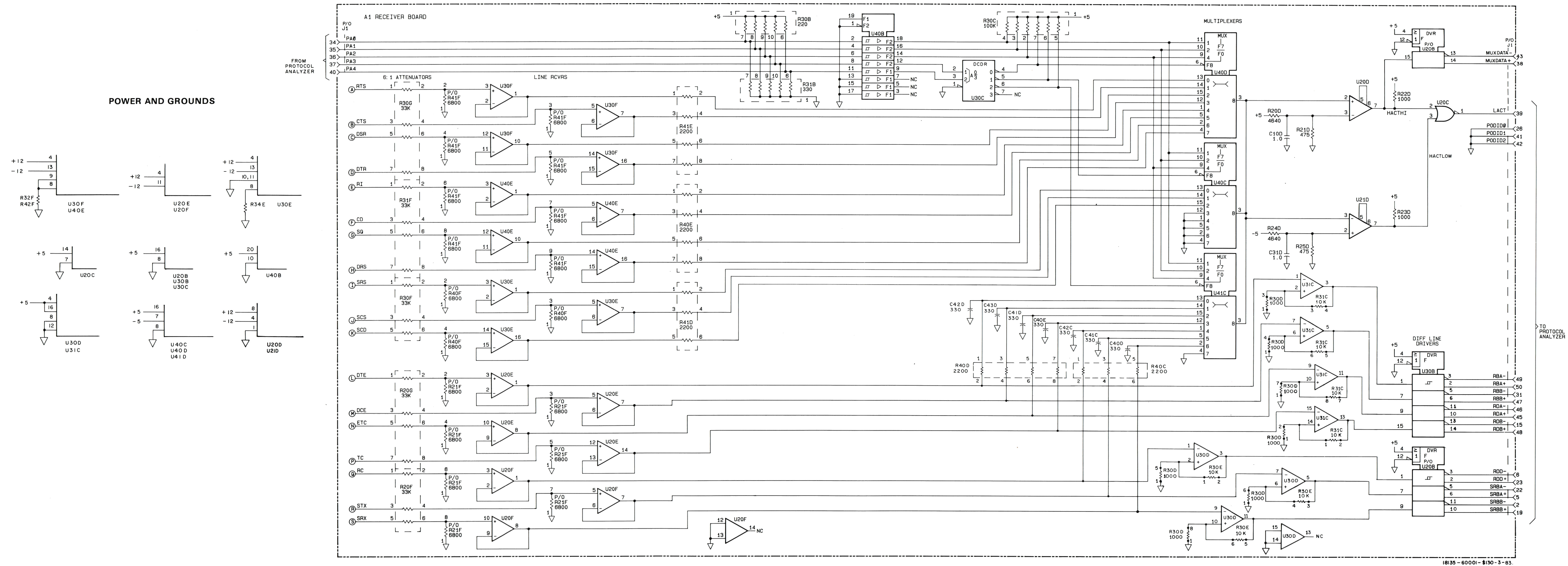


Figure 8-4. A2 Transmitter Schematic
8-11



8-12



**Figure 8-6. Model 18135A A1 Receiver Schematic
8-13/(8-14 blank)**

POWER AND GROUNDS

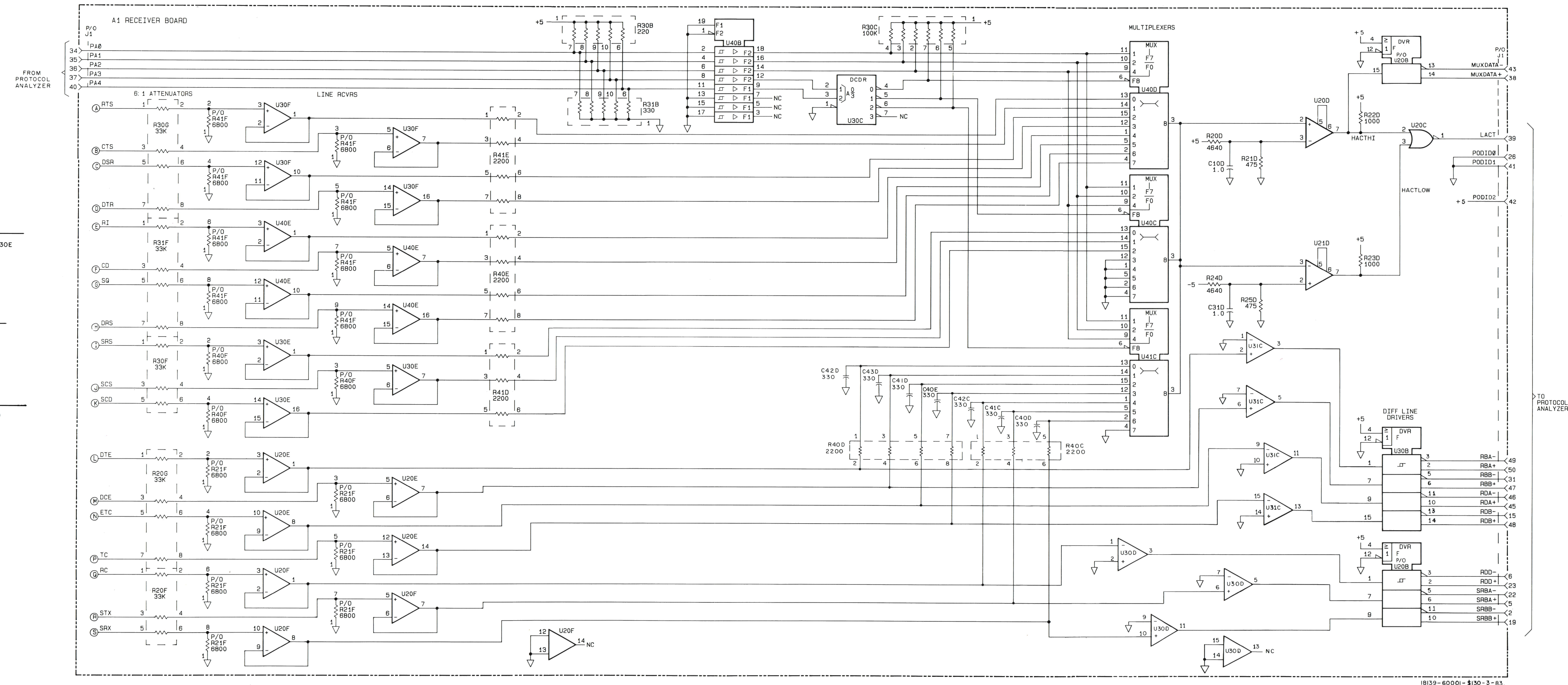
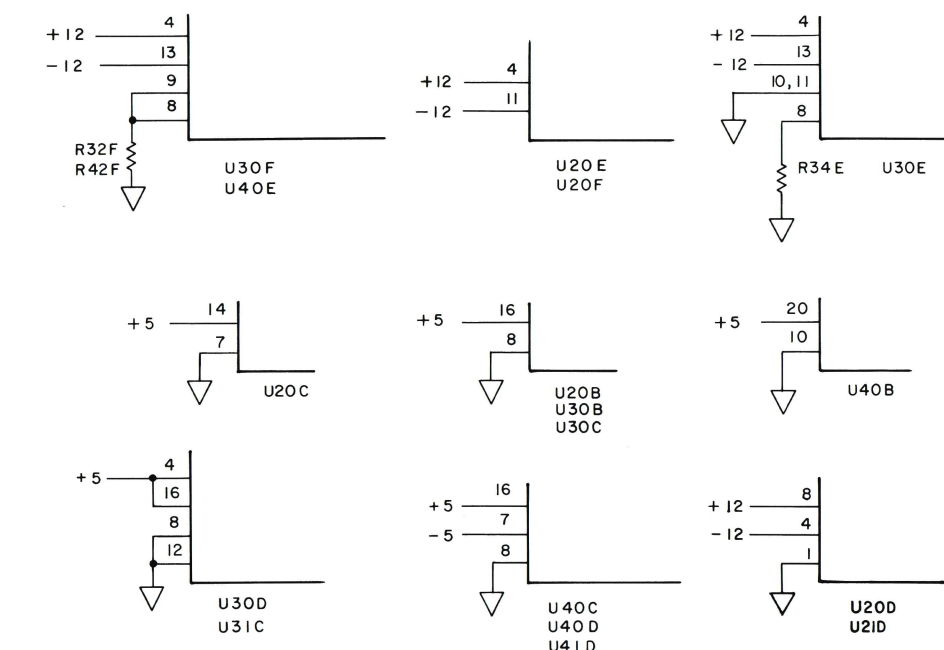


Figure 8-7. Model 18139A A1 Receiver Schematic

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- C Computer Systems
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C,M

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A,CM,CP,E,MS

Ohio

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Arranged alphabetically by country

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P

U.S.S.R.

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A, E, M, P

ZIMBABWE

Field Technical Sales
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P.B. 3458
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Hewlett-Packard Co.
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MIDWESTERN USA

Illinois
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SOUTHERN USA

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Hewlett-Packard Co.
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450 Interstate N. Parkway
ATLANTA, GA 30339
Tel: (404) 955-1500

WESTERN USA

California
Hewlett-Packard Co.
3939 Lankersim Blvd.
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SWITZERLAND

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7 Rue du Bois-du-Lan
CH-1217 MEYRIN 2, Switzerland
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Telex: 27835 hpse
Cable: HEWPACKSA Geneve

EAST EUROPEAN AREAS NOT LISTED, CONTACT

AUSTRIA

Hewlett-Packard Ges.m.b.H.
Wehlstrasse 29
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Telex: 135823/135066

MEDITERRANEAN AND MIDDLE EAST AREAS NOT LISTED, CONTACT

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Hewlett-Packard S.A.
Mediterranean & Middle East
Operations
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Platia Kefallariou
GR-Kifissia, ATHENS, Greece
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Telex: 21-6588
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INTERNATIONAL AREAS NOT LISTED, CONTACT

OTHER AREAS

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Intercontinental Headquarters
3495 Deer Creek Road
PALO ALTO, CA 94304
Tel: (415) 857-1501
Telex: 034-8300
Cable: HEWPACK



Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY _____

ADDRESS _____

TECHNICAL CONTACT PERSON _____

PHONE NO. _____ EXT. _____

MODEL NO. _____ SERIAL NO. _____

MODEL NO. _____ SERIAL NO. _____

P.O. NO. _____ DATE _____

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER _____ over _____



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P.O. NO. _____ DATE _____

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TECHNICAL CONTACT PERSON _____

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MODEL NO. _____ SERIAL NO. _____

MODEL NO. _____ SERIAL NO. _____

P.O. NO. _____ DATE _____

Accessories returned with unit

☐ NONE ☐ CABLE(S)

☐ POWER CABLE ☐ ADAPTER(S)

OTHER _____ over _____

Service needed

☐ CALIBRATION ONLY
☐ REPAIR ☐ REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

FAILURE SYMPTOMS/SPECIAL
CONTROL SETTINGS _____

If unit is part of system list model
number(s) of other interconnected in-
struments. _____

Printed in U.S.A.

Service needed

☐ CALIBRATION ONLY
☐ REPAIR ☐ REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

☐ CONSTANT ☐ INTERMITTENT

SENSITIVE TO:

☐ COLD ☐ HEAT ☐ VIBRATION

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CONTROL SETTINGS _____

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